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(54) **USING NEURAL NETWORKS TO ESTIMATE MOTION VECTORS FOR MOTION CORRECTED PET IMAGE RECONSTRUCTION**

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(57) **ABSTRACT**

To reduce the effect(s) caused by patient breathing and movement during PET data acquisition, an unsupervised non-rigid image registration framework using deep learning is used to produce motion vectors for motion correction. In one embodiment, a differentiable spatial transformer layer is used to warp the moving image to the fixed image and use a stacked structure for deformation field refinement. Estimated deformation fields can be incorporated into an iterative image reconstruction process to perform motion compensated PET image reconstruction. The described method and system, using simulation and clinical data, provide reduced error compared to at least one iterative image registration process.